EPI-LOG

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Enterohemorrhagic (Shiga toxin-producing) *E. coli*

Enterohemorrhagic *E. coli* infection (EHEC), also called Shiga toxin-producing *E.coli*, (STEC) and verotoxin-producing *E. coli* (VTEC) cause severe diarrhea with hemorrhagic colitis. Health care providers should always consider this diagnosis in patients with bloody diarrhea, and should understand that a negative stool culture alone is not sufficient to rule out this infection.

Background

Escherichia coli O157:H7 and other EHEC produce a toxin similar to that produced by *Shigella dysenteriae type* 1, resulting in cell death and necrosis of colonic epithelium. These organisms have been recognized as a cause of diarrhea only since 1982 when two large outbreaks of hemorrhagic colitis (in Oregon and Michigan) caused by E. coli O157:H7 were identified.

EHEC infection is characterized by diarrhea (which is often bloody) accompanied by abdominal cramps (often severe) and little or no fever. The incubation period is typically 3 to 5 days, but can range from 1 to 8 days or longer. Most people recover without antibiotics or other specific treatment within 5 to 10 days. Because there is no evidence that antibiotics improve the course of disease, and because there is evidence that antibiotics may increase the risk of kidney complications (such as hemolytic uremic syndrome), antibiotics are not recommended for EHEC infections.

Hemolytic uremic syndrome (HUS) or thrombotic thrombocytopenic purpura (in adults) occurs in 2 to 8 percent of all cases and in 10 percent of infected children under 11 years of age. HUS has a case fatality rate of 3 to 5 percent.

Epidemiology of EHEC

Cattle are the primary reservoir for EHEC and sources of transmission include consumption of undercooked contaminated ground beef and other beef products; unpasteurized milk, cheese, and juice; contaminated raw fruits, vegetables, and herbs; water contaminated with animal feces; direct contact with farm animals; and swimming or playing in contaminated lakes and pools. Person-to-person transmission can occur within households, child daycare centers, and other institutions. It is estimated that up to 75,000 cases and over 60 deaths due to EHEC infection occur in the United States each year. In King County, approximately 45 cases of EHEC are reported per year, the vast majority of which are *E. coli* O157:H7. (Cases of non-O157:H7 E. coli range from 0 to 6 per year).

Molecular Epidemiology and Outbreak Detection of EHEC

The most recent major multistate outbreak of EHEC in the United States occurred in fall of 2006 when 199 people became infected with *E. coli* O157:H7 after eating bagged spinach from a farm in California. Because the EHEC outbreak associated with spinach was widespread (23 states) and involved a relatively low number of cases in any one locality, the identification of the outbreak relied heavily on results from national surveillance using molecular epidemiology typing, specifically pulsed field gel electrophoresis or PFGE. The ability to identify cases with indistinguishable PFGE patterns allowed investigators to focus in on exposures common to these cases. Once a suspected source was identified, PFGE analysis showed that EHEC recovered from the implicated spinach was indistinguishable from the outbreak pattern from human cases. All EHEC (and *Salmonella, Shigella* and *Listeria*) isolates that are submitted for confirmation by clinical labs in Washington State are analyzed using PFGE at the Washington State Public Health Laboratory.

Laboratory Diagnosis of non-O157:H7 EHEC

E. coli O157:H7 is the most common EHEC serotype in the United States and is responsible for the majority of severe cases; however, studies suggest that non-O157 serotypes may be just as prevalent. One reason that non-O157 serotypes are so rarely identified is due to the way that *E. coli* O157:H7 testing is performed in many labs.

E. coli O157:H7 appears as a clear colony when grown on selective media (Sorbitol-MacConkey agar), which makes it readily identifiable. However, non-O157 serotypes appear pink when grown on this same media, as do many nonpathogenic organisms naturally present in human stool, and are therefore overlooked. Testing stool specimens for Shiga toxin in addition to culture is the recommended way that non-O157:H7 serotypes can be identified. Some, but not all laboratories in King County have begun offering Shiga toxin testing. The Public Health Seattle & King County Laboratory currently tests all stool specimens submitted for enteric pathogens for the presence of Shiga toxin as an adjunct to culture on selective

media. The combination of culture on selective media and Shiga toxin testing is recommended by the Center for Disease Control for all specimens tested for enteric pathogens. Colonies that grow from specimens that are Shiga toxin positive and *E. coli* O157:H7 culture negative, can be evaluated for the presence of non-O157:H7 EHEC.

Unfortunately, a few laboratories have abandoned the practice of culturing stool specimens for *E. coli* O157:H7 altogether, and are testing for Shiga toxin alone. The downside of this practice is that there is no isolate available for speciation, serotyping, subtyping, and PFGE analysis, and can increase the time it takes to identify outbreaks.

Prompt Reporting of EHEC Upon Suspicion Can Help Identify Outbreaks

In 2001, in Washington State, non-O157:H7 EHEC joined *E. coli* O157:H7 as immediately reportable to local Public Health **upon suspicion or confirmation (including Shiga toxin positive specimens)**. These cases should be reported day or night by calling 206-296-4774. Prompt reporting of suspect EHEC cases can help in the identification of outbreaks, and Public Health can facilitate Shiga-toxin testing for patients suspected of having EHEC infections but who are *E. coli* O157:H7 negative on culture. In addition, Public Health can assist with the timely culture of specimens from patients who are Shiga toxin positive from labs that do not routinely culture for EHEC.

West Nile Virus Monthly Update

As of September 26, 2007 there have been no locally-acquired human cases of West Nile Virus (WNV) in Washington State and no mosquito pools have tested positive. However, 8 horses and one bird in Yakima County have tested positive for WNV infection, and two King County residents were reported with West Nile fever acquired outside Washington State.

Elsewhere in the U.S. there have been 2,307 human WNV cases reported including cases from California (257), Montana (151), Idaho (70) and Oregon (17). More information on WNV activity in the U.S. is online at www.cdc.gov/ncidod/dvbid/westnile/index.htm

Clinicians should consider WNV in the differential diagnosis of all patients with meningitis and/or encephalitis of unknown etiology during mosquito season (in Northwest U.S., this is typically May through October), particularly in elderly patients presenting with weakness or acute flaccid paralysis or presumed Guillain-Barré syndrome.

For more WNV information on diagnosis and testing, and other resources, please see: www.metrokc.gov/health/providers/wnv-clinicians.htm

Disease Reporting

AIDS/HIV ..... (206) 296-4645
STDs..... (206) 744-3954
TB ..... (206) 744-4579
All Other Notifiable Communicable Diseases (24 hours a day) .... (206) 296-4774
Automated reporting line for conditions not immediately notifiable ..... (206) 296-4782

Hotlines

Communicable Disease ..... (206) 296-4949
HIV/STD ..... (206) 205-STDS

Public Health-Seattle & King County Online Resources

Home Page: www.metrokc.gov/health/
The *EPI-LOG*: www.metrokc.gov/health/providers
Communicable Disease listserv (PHSKC INFO-X) at: mailman.u.washington.edu/mailman/listinfo/phskc-info-x

West Nile Virus Updates and Current Testing Guidelines: www.metrokc.gov/health/westnile/advisories.htm

Reported Cases of Selected Diseases, Seattle & King County 2007

	Cases Reported in August		Cases Reported Through August	
	2007	2006	2007	2006
Campylobacteriosis	37	22	161	172
Cryptosporidiosis	10	3	27	23
Chlamydial infections	519	481	3673	3431
Enterohemorrhagic *E. coli* (non-O157)	1	0	4	2
***E. coli* O157: H7**	13	9	24	32
Giardiasis	11	7	94	72
Gonorrhea	131	209	1015	1342
***Haemophilus influenzae* (cases <6 years of age)**	0	1	2	3
Hepatitis A	3	1	10	10
Hepatitis B (acute)	2	1	10	17
Hepatitis B (chronic)	75	64	555	542
Hepatitis C (acute)	1	1	5	6
Hepatitis C (chronic, confirmed/probable)	112	146	895	1023
Hepatitis C (chronic, possible)	35	23	224	187
Herpes, genital (primary)	45	83	430	542
HIV and AIDS (including simultaneous diagnoses with AIDS)	39	33	233	160
Measles	0	0	1	0
Meningococcal Disease	1	2	5	7
Mumps	0	0	4	2
Pertussis	2	9	45	82
Rubella	0	0	0	0
Rubella, congenital	0	0	0	0
Salmonellosis	25	31	176	131
Shigellosis	4	10	37	33
Syphilis	23	20	108	155
Syphilis, congenital	0	0	0	0
Syphilis, late	12	12	51	55
Tuberculosis	--*	--	--	--

*Due to data reporting problems numbers are not available for August.

The *EPI-LOG* is available in alternate formats upon request.